

**TYHEE AND S&N ESTATES WATER ASSOCIATION (PWS 6030044)
SOURCE WATER ASSESSMENT FINAL REPORT**

April 23, 2002



**State of Idaho
Department of Environmental Quality**

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Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This assessment is based on a land use inventory of the designated assessment area and sensitivity factors associated with the wells and aquifer characteristics.

This report, *Source Water Assessment for the Tyhee and S&N Estates Water Association, Pocatello, Idaho* describes the public drinking water system, the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

The Tyhee and S&N Estates Water Association (Public Water System 6030044) is classified as a community water system. The drinking water system consists of two well sources, Tyhee Well and S&N Well. The wells serve approximately 200 persons and are located in the subdivision.

The potential contaminant sources within the delineation capture zones a sand and gravel pit and surface water bodies (canals and a river). Also found were sites regulated under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the Resource Conservation Recovery Act (RCRA). Additionally, US Highway 91, a railroad, and Interstate 15 are transportation corridors that cross the delineations. If an accidental spill occurred from these corridors, inorganic chemical contaminants, volatile organic chemical contaminants, synthetic organic chemical contaminants, or microbial contaminants could be added to the aquifer system. Other sources identified that may contribute to the overall vulnerability of the water source were business within the delineated areas that may be considered potential contaminants sources. A complete list of potential contaminant sources is provided with this assessment (Table 1).

For the assessment, a review of laboratory tests was conducted using the Idaho Drinking Water Information Management System (DWIMS) and the State Drinking Water Information System (SDWIS). Lab results have detected the presence of total coliform bacteria in the distribution system. For the Tyhee well, the inorganic chemicals arsenic, barium, chromium, fluoride, mercury, nitrate and sodium have been detected in the drinking water, but at levels below the maximum contaminant level for each chemical. The volatile organic chemicals, tetrachloroethylene and 1,2-dichloroethane were detected in the well water. Tetrachloroethylene was detected in 1993, 1996, and 1997 with concentrations ranging from 0.6 micrograms per liter to 3.46 micrograms per liter (maximum contaminant level is 5 micrograms per liter). The 1,2-dichloroethane was detected in 1996 at a concentration of 5.9 micrograms per liter (maximum contaminant level is 5 micrograms per liter). No synthetic organic chemicals have been detected in the drinking water. For the S&N well, the inorganic chemicals arsenic, barium calcium, fluoride, iron, nitrate, and sodium have been detected in the drinking water, but at levels below the maximum contaminant level. The volatile organic chemicals, tetrachloroethylene and 1,2-dichloroethane were detected in the well water. Tetrachloroethylene was detected in 1993, 1994, 1996, and 1997 with concentrations ranging from 0.5 micrograms per liter to 3.3 micrograms per liter (maximum contaminant level is 5 micrograms per liter). The 1,2-dichloroethane was

detected in 1996 at a concentration of 5.5 micrograms per liter (maximum contaminant level is 5 micrograms per liter). Neither well has detected the presence of the volatile organic chemicals since 1997. No synthetic organic chemicals have been detected in drinking water.

The susceptibility ratings for the Tyhee and S&N Estates Water Association drinking water system were based upon available information relating to soil drainage characteristics, agricultural land use, system construction, and potential contaminant sources identified within the wells' zones of contribution. The final susceptibility ranking for the wells are high for inorganic, volatile organic, synthetic organic and microbial contaminants.

The capture zones for the wells intersect a priority area for the inorganic chemical, nitrate and the synthetic organic chemicals, ethylene dibromide and atrazine. The nitrate priority area is where greater than 25% of wells show nitrate values above 5 milligrams per liter (mg/l). The organic priority area is areas where greater than 25 % of the wells show levels greater than 1% of the primary standard or other health standards (maximum contaminant level for ethylene dibromide is 5 micrograms per liter and 3 micrograms per liter for atrazine). Ethylene dibromide can be used as a pesticide and atrazine is a widely used herbicide for control of broadleaf and grassy weeds.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

For the Tyhee and S&N Estates Water Association, drinking water protection activities should continue efforts aimed at keeping the distribution system free of microbial contaminants that may affect the drinking water quality. If tetrachloroethylene concentrations or other chemicals tested approach or exceed the maximum contaminant level, the system should take appropriate measures to treat the water source. Treatments, such as disinfectant and filtration for microbials and granular activated charcoal and packed tower aeration for volatile organic chemical contaminants should be investigated to remedy these problems. In addition, drinking water protection activities should focus on correcting any deficiencies outlined in the sanitary survey (an inspection conducted every five years with the purpose of determining the physical condition of a water system's components and its capacity). The well should maintain sanitary standards regarding wellhead protection. Also, any new sources that could be considered potential contaminant sources in the wells' zones of contribution should also be investigated and monitored to prevent future contamination. No potential contaminants (pesticides, paint, fuel, cleaning supplies, etc.) should be stored or applied within 50 feet of the well. Land uses within most of the source water assessment area are outside the direct jurisdiction of the Tyhee and S&N Estates Water Association. Therefore partnerships with state and local agencies, industrial and commercial groups should be established to ensure future land uses are protective of ground water quality. Educating homeowners about source water will further assist the system in its monitoring and protection efforts.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan. Public education topics could include household hazardous waste disposal methods and the importance of water conservation to name but a few. There are multiple resources available to help water systems implement protection programs, including the Drinking Water Academy of the U.S. Environmental Protection Agency. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture and the Bannock County Soil and Water Conservation District. As major transportation corridors intersect the delineations (such as Interstate 15), the Idaho Department of Transportation should be involved in protection efforts.

A system must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the Idaho Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR TYHEE and S&N ESTATES WATER ASSOCIATION, POCATELLO, IDAHO

Section 1. Introduction - Basis for Assessment

The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are contained in this report. The list of significant potential contaminant source categories and their rankings used to develop this assessment is also attached.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the wells, and aquifer characteristics. All assessments must be completed by May of 2003. The resources and time available to accomplish assessments are limited. Therefore, an in-depth, site-specific investigation to identify each significant potential source of contamination for every public water system is not possible. **This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. DEQ recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a drinking water protection program should be determined by the local community based on its own needs and limitations. Wellhead or drinking water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Section 2. Conducting the Assessment

General Description of the Source Water Quality

The Tyhee and S&N Estates Water Association is a community public drinking water system located in Bannock County (Figure 1). This system consists of two well sources that provides drinking water to approximately 200 persons. At this time, there appears to be no primary water quality issues associated with the system. However, volatile organic chemicals (VOCs), tetrachloroethylene and 1,2-dichloroethane, have been detected in the drinking water from 1993 to 1997. The 1,2-dichloroethane was detected above the maximum contaminant level (MCL) of 5 micrograms per liter in July 1996.

The inorganic chemicals (IOCs) arsenic, barium, chromium, fluoride, mercury, nitrate, and sodium represent the main water chemistry constituents recorded in the public water system, although the reported concentrations of these chemicals were below the MCL for each chemical, as set by the EPA. Total coliform bacteria have been detected in the distribution system. Water chemistry tests have not detected synthetic organic contaminants (SOCs) in the drinking water.

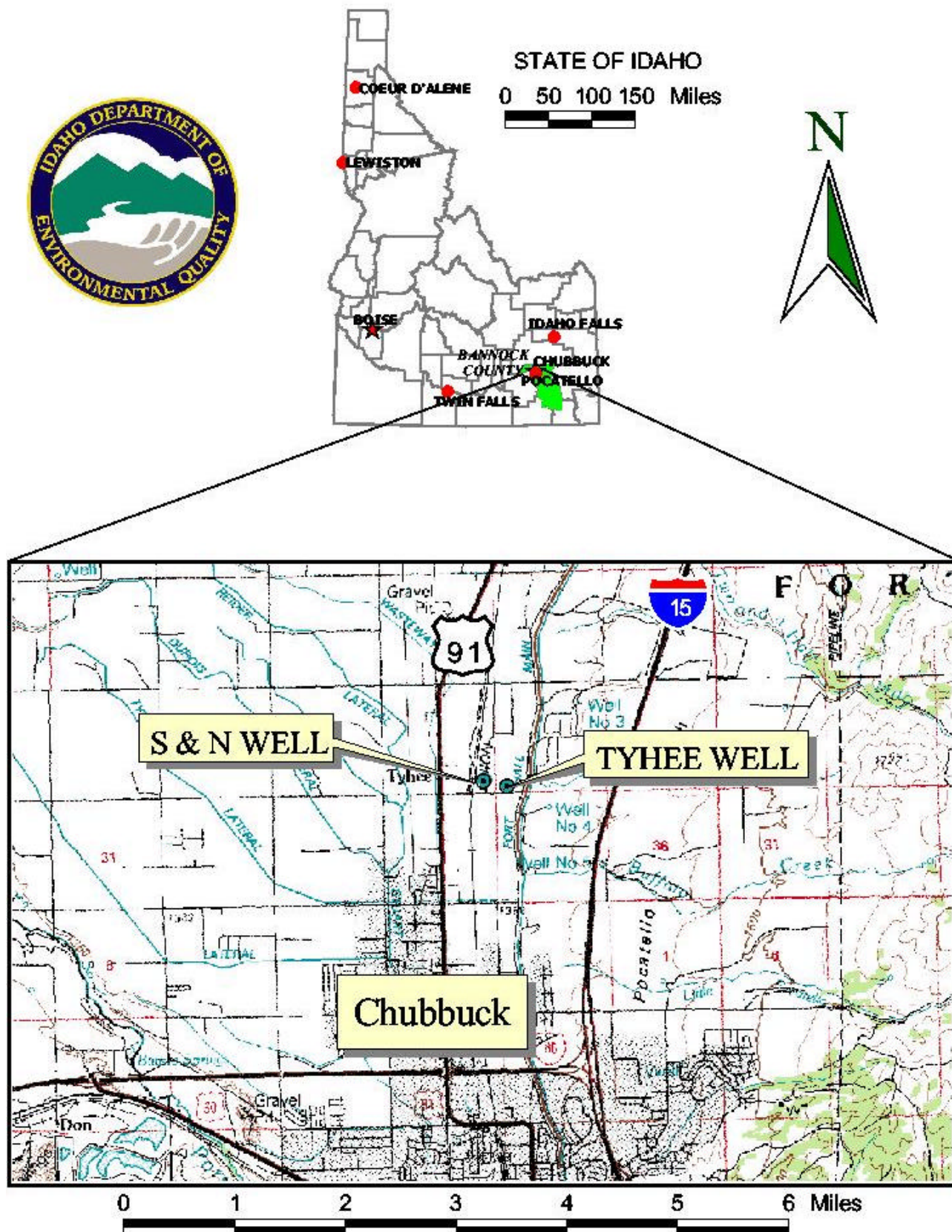
Defining the Zones of Contribution--Delineation

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel zones (zones indicating the number of years necessary for a particle of water to reach a pumping well) for water in the aquifer. Washington Group International (WGI) was contracted by DEQ to define the public water system's zones of contribution. WGI used a refined computer model approved by the EPA in determining the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) Time-of-Travel (TOT) for water associated with the East Margin Area of the Eastern Snake River Plain (ESRP) hydrologic province in the vicinity of the Tyhee and S&NEstates Water Association. The computer model used site specific data, assimilated by WGI from a variety of sources including operator records and hydrogeologic reports. A summary of the hydrogeologic information from the WGI is provided below.

The East Margin Area encompasses 821 square miles, representing approximately 8 percent of the total area of the ESRP hydrologic province. The majority of the East Margin Area is within Bingham County, with small areas occurring in Bannock, Bonneville, and Power counties.

The regional ESRP aquifer is the most significant aquifer in the East Margin Area and consists primarily of basalt of the Quaternary-aged Snake River Group. However, additional water-bearing units are used for water supply along the margin of the ESRP. In order of decreasing age, the most significant aquifers in the Michaud Flats area are bedded rhyolite (volcanic rock) of the Tertiary-aged Starlight Formation and Quaternary-aged gravels of a low relief plain formed by running water (pediment), basalt of the Big Hole Formation, and stream deposits of the Sunbeam Formation (see Jacobson, 1982, p. 7, and Corbett, et al., 1980, pp. 6-10). A few shallow domestic wells in the central Michaud Flats area also are completed in Michaud Gravel, which is the shallow water-table aquifer. The American Falls Lake Beds Formation (AFLB) confines the deeper aquifers and averages 80 feet in thickness in the central Michaud Flats area (Jacobson, 1984, p. 6). The AFLB pinches out in the eastern Michaud Flats area near the Portneuf River, effectively combining the shallow and deep stream deposits into a single water table aquifer (Bechtel, 1994, p. 2-2).

FIGURE 1 - Geographic Location of Tyhee and S & N Water Association, PWS 6030044, Tyhee Well and S & N Well



Other aquifers in the East Margin Area include fractured quartzite that has been developed near Blackfoot, stream deposits near the cities of Firth and Basalt, and pediment gravels in the Gibson Terrace area near Tyhee and Chubbuck.

PWS wells in the East Margin Area of the ESRP province produce water from five different aquifers: the Regional Eastern Snake River Plain aquifer, three alluvial (or stream deposited) aquifers (Eastern Michaud Flats, Firth/Basalt, and Gibson Terrace/Pocatello Bench) and a quartzite aquifer (Blackfoot).

The ESRP is a northeast trending basin located in southeastern Idaho. The 10,000 square miles of the plain are primarily filled with highly fractured layered Quaternary-aged basalt flows of the Snake River Group, which are between (intercalated) layers of rocks formed by sediment deposition (sedimentary) along the margins (Garabedian, 1992, p. 5). Quaternary-aged basalts are estimated to be 100 to 1,500 feet thick, with the majority of the area in the range of 100 to 500 feet thick (Whitehead, 1992, Plate 3). Individual basalt flows range from 10 to 50 feet thick, averaging 20 to 25 feet thick (Lindholm, 1996, p. 14). Basalt is thickest in the central part of the eastern plain and thins toward the margins. Whitehead (1992, p. 9) estimates the total thickness of the flows to be as great as 5,000 feet. A thin layer (0 to 100 feet) of windblown and stream-produced sediments overlies the basalt. The plain is bounded on the northeast by rocks of the Yellowstone Group (mainly rhyolite) and Idavada Volcanics to the southwest. These rocks may also underlie the plain (Garabedian, 1992, p. 5). Granite of the Idaho batholith borders the plain to the northwest, along with sedimentary rocks and rocks changed by heat and/or pressure (metamorphic) (Cosgrove et al., 1999, p. 10).

The Snake River flows along part of the southern boundary and is the only drainage that leaves the plain. A high degree of connectivity with the regional aquifer system is displayed over much of the river as it passes through the plain. However, some reaches are believed to be perched or separated from the main ground water by unsaturated rock, such as the Lewisville-to-Shelly reach. Rivers and streams entering the plain from the south are tributary to the Snake River. With the exception of the Big and Little Wood rivers, rivers entering from the north vanish into the basalts of the Snake River Plain aquifer that have a higher ability to transmit water.

The layered basalts of the Snake River Group host one of the most productive aquifers in the United States. The aquifer is generally considered unconfined, yet may be confined locally because of interbedded clay and dense unfractured basalt (Whitehead, 1992, p. 26). Whitehead (1992, p. 22) and Lindholm (1996, p.1) report that well yields of 2,000 to 3,000 gal/min are common for wells open to less than 100 feet of the aquifer. Transmissivities obtained from test data in the upper 100 to 200 feet of the aquifer range from less than 0.1 square feet per second (ft^2/sec) to $56 \text{ ft}^2/\text{sec}$ (1.0×10^4 to $4.8 \times 10^6 \text{ ft}^2/\text{day}$; Garabedian, 1992, p. 11, and Lindholm, 1996, p. 18). Lindholm (1996, p. 18) estimates aquifer thickness to range from 100 feet near the plain's margin to thousands of feet near the center. Models of the regional aquifer have used values ranging from 200 to 3,000 feet to represent aquifer thickness (Cosgrove et al., 1999, p.15).

Regional ground water flow is to the southwest paralleling the basin (Cosgrove et al., 1999; deSonneville, 1972, p. 78; Garabedian, 1992, p. 48; and Lindholm, 1996, p. 23). Reported water table gradients range from 3 to 100 ft/mile and average 12 ft/mile (Lindholm, 1996, p. 22). Gradients steepen at the plain's margin and at discharge locations. The estimated effective ratio of the rock's open space volume to its total volume range from 0.04 to more than 0.25 (Ackerman, 1995, p.1, and Lindholm, 1996, p.16).

The majority of aquifer recharge results from surface water irrigation activities (incidental recharge), which divert water from the Snake River and its tributaries (Ackerman, 1995, p. 4, and Garabedian, 1992, p. 11) and locally from canal leakage. Natural recharge occurs through stream losses, direct precipitation, and tributary basin underflow.

Aquifer discharge occurs primarily as seeps and springs on the northern wall of the Snake River canyon near Thousand Springs and near American Falls and Blackfoot (Garabedian, 1992, p.17). To a lesser degree, discharge also occurs through pumping and underflow.

The East Margin Area is among the most transmissive regions of the regional aquifer, therefore it has a higher ability to transmit water. A transmissivity of 21 ft²/sec was used to represent the upper 200 feet of the regional aquifer in the East Margin Area in the three-dimensional USGS ground water flow model (Garabedian, 1992, Plate 6). The equivalent hydraulic conductivity or the rate at which water can move through permeable material is 9,072 feet per day (ft/day). This value is consistent with the range of hydraulic conductivity (9,500 to 11,708 ft/day) calculated using data from a constant-rate aquifer test conducted in 1981 (Jacobson, 1982, p. 23). This range was calculated by dividing the estimated transmissivity (228,000 to 281,000 ft²/day) by the perforated interval of the observation well (24 feet). The geometric mean hydraulic conductivity based on analysis of specific capacity data from PWS wells (135 ft/day) is significantly lower.

A published water table map of the Upper Snake River Basin (IDWR, 1997, p. 9) indicates that the ground water flow direction in the ESRP aquifer in the East Margin Area is similar to that depicted at the regional scale (e.g., Garabedian, 1992, Plate 4).

Recharge from precipitation and surface water irrigation in the East Margin Area ranges from less than 10 to more than 20 inches per year (Garabedian, 1992, Plate 8). The low end of the range applies to the area near Blackfoot, while the high end applies to the area on the west side of American Falls Reservoir near Aberdeen.

Kjelstrom (1995, p. 13) reports an annual river loss of 280,000 acre-feet to the regional basalt aquifer for the 27.5-mile Lewisville-to-Shelley reach of the Snake River and 110,000 acre-feet for the 23.5-mile Shelley-to-Blackfoot reach (Figure 3). Annual river gains of 1,900,000 acre-feet for the 36.6-mile Blackfoot-to-Neeley reach are also estimated (Kjelstrom, 1995, p. 13). A seepage study conducted in the fall of 1980 on the Portneuf River showed a gain of about 560 cubic feet per second (ft³/sec) (405,691 acre-feet) for the 13-mile Pocatello-to-American Falls Reservoir reach (Jacobson, 1982, p. 16). The average flow in the Blackfoot River near the city of Blackfoot is low at Station #13068500 (5.2 ft³/sec; USGS, 2001) compared to the flow in the Snake River near the city of Blackfoot at Station #13069500 (2,900 ft³/sec; USGS, 2001).

The water producing zones for the Tyhee and S&N Estates Water Association wells are completed in the regional basalt aquifer. The delineated source water assessment area for the Tyhee and S&N Estates Water Association well trends in a northeast direction and is elongated and conical in shape. However, in this case, the delineation only has a 3- and 6- year TOT because the mountains are assumed to be the boundary source of the aquifer. The actual data used by WGI in determining the source water assessment delineation areas are available from DEQ upon request.

Identifying Potential Sources of Contamination

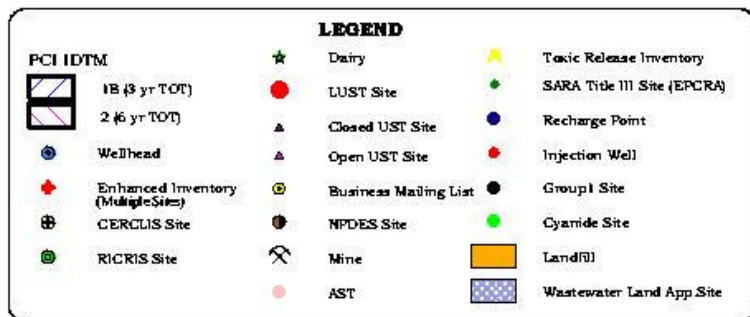
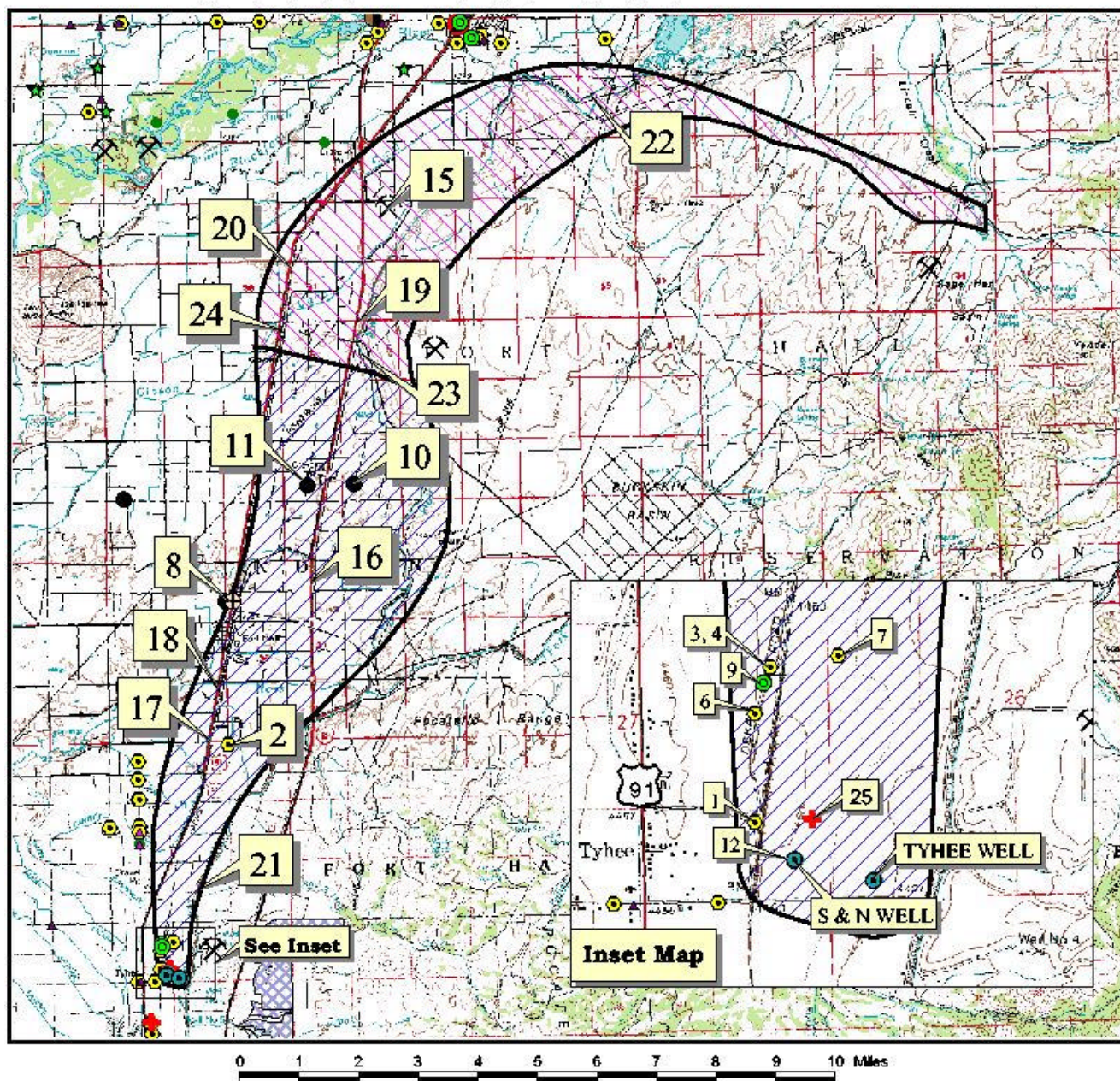
A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act. Furthermore, these sources have a sufficient likelihood of releasing such contaminants into the environment at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Field surveys conducted by DEQ and reviews of available databases identified potential contaminant sources within the delineation areas. Some of these sources include business mailing list sites, roadways and a railroad.

It is important to understand that a release may never occur from a potential source of contamination provided best management practices are used at the facility. Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, such as educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply well.

Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted during January of 2002. The first phase involved identifying and documenting potential contaminant sources within the Tyhee and S&N Estates Water Association source water assessment area through the use of computer databases and Geographic Information System (GIS) maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator to validate the sources identified in phase one and to add any additional potential sources in the area. This task was undertaken with the assistance of Mr. Bob Meline. At the time of the enhanced inventory, additional potential contaminant sources were found (septic systems) within the delineated source water area. Maps with well locations, delineated areas and potential contaminant sources are provided with this report (Figure 2). Each potential contaminant source has been given a unique site number that references tabular information associated with the public water wells (Table 1).

FIGURE 2 - Tyhee and S & N Estates Water Assn. Delineation Map and Potential Contaminant Source Locations



W. Kelley 12/6/01
M. Byrd 4/18/02

PWS# 6030044
Tyhee Well and
S & N Well

Table 1. Tyhee and S&N Estates Water Association, Potential Contaminant Inventory

*Site #	Source Description ¹	TOT Zone (years) ²	Source of Information	Potential Contaminants ³
1	General contractor	0-3	Database Inventory	IOC, VOC, SOC
2	Landscaping Equipment and Supplies	0-3	Database Inventory	IOC, SOC
3	Rental Services-Stores and yards	0-3	Database Inventory	VOC, SOC
4	Welding Equipment	0-3	Database Inventory	IOC, VOC, SOC
6	Welding Facility	0-3	Database Inventory	IOC, VOC, SOC
7	Dental Laboratories	0-3	Database Inventory	IOC, VOC, SOC, Microbials
8	CERCLA Site	0-3	Database Inventory	VOC, SOC
9	RCRA Site	0-3	Database Inventory	IOC, VOC, SOC
10	Group 1 Site (nitrate)	0-3	Database Inventory	
11	Group 1 Site (ethyl dibromide)	0-3	Database Inventory	
12	Group 1 Site (tetrachloroethylene & dichloroethylene)	0-3	Database Inventory	
15	Gravel Pit	3-6	Database Inventory	IOC, VOC, SOC
16	Interstate 15	0-3	GIS Map	IOC, VOC, SOC, Microbials
17	Highway 91	0-3	GIS Map	IOC, VOC, SOC, Microbial
18	Railroad	0-3	GIS Map	IOC, VOC, SOC, Microbials
19	Interstate 15	3-6	GIS Map	IOC, VOC, SOC
20	Highway 91	3-6	GIS Map	IOC, VOC, SOC
21	Canal	0-3	GIS Map	IOC, VOC, SOC, Microbials
22	Blackfoot River	3-6	GIS Map	IOC, VOC, SOC
23	Canal	3-6	GIS Map	IOC, VOC, SOC
24	Railroad	3-6	GIS Map	IOC, VOC, SOC
25	Septic systems	0-3	Enhanced Inventory	IOC, Microbials

¹ RCRA = Resource Conservation Recovery Act,

CERCLA = Comprehensive Environmental Response Compensation and Liability Act

² TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead

³ IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical;

* Site numbers are non-sequential

Section 3. Susceptibility Analyses

The susceptibility of the wells to contamination was ranked as high, moderate, or low risk according to the following considerations: hydrologic characteristics, physical integrity of the wells, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for the wells is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. Attachment A contains the susceptibility analysis worksheet. The following summaries describe the rationale for the susceptibility ranking.

Hydrologic Sensitivity

The hydrologic sensitivity of a well is dependent upon four factors. These factors are surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone above the water producing zone of the well. Slowly draining soils such as silt and clay typically are more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet from the surface protect the ground water from contamination.

Hydrologic sensitivity was rated high for both wells (Table 2). This is based upon moderate to well drained soil classes defined by the National Resource Conservation Service (NRCS). Soils that have poor to moderate drainage characteristics have better filtration capabilities than faster draining soils. The wells are also potentially sensitive due to their vadose compositions consisting mostly of sand, gravel, and sandy clay. The depth to first ground water for both wells is less than 300 feet from the surface. In addition, the wells lack 50 feet cumulative thickness of low permeability material that helps to reduce the downward movement of contaminants.

Well Construction

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system that can better protect the water. If the casing and annular seal both extend into a low permeability unit then the possibility of cross contamination from other aquifer layers is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have better buffering capabilities. When information was adequate, a determination was made as to whether the casing and annular seals extend into low permeability units and whether current public water system (PWS) construction standards are met.

For the Tyhee well, the system construction score was rated high. The sanitary survey states there is no well vent on the wellhead. The purpose of the vent is to vent the space between the casing and the column and prevent a vacuum from forming when the well turns on and draws down the water table. A vacuum could draw in contamination through joints or leaks in the casing or cause the well to slough. The sanitary survey also states the surface seal is in good condition. The well log indicates the casing extends 175 feet below ground surface (bgs) into a shale and sandstone formation. The annular seal extends 48 feet into a sand and gravel formation. The static water level was recorded at 70 feet bgs in 1993 and the highest production unit occurs from 130 feet to 140 feet. The well casing extends 12-inches above the ground level and is located outside of a 100-year floodplain, decreasing the chance of contaminants being drawn into the drinking water source by surface water flooding.

For the S&N well, the system construction score was rated moderate. The sanitary survey states there is no well vent on the wellhead. The purpose of the vent is to vent the space between the casing and the column and prevent a vacuum from forming when the well turns on and draws down the water table. A vacuum could draw in contamination through joints or leaks in the casing or cause the well to slough. The sanitary survey also states the surface seal is in good condition. The well log indicates the casing extends 205 feet below ground surface (bgs) into lava rock. There was insufficient well log information to determine the depth of the annular seal. The static water level was recorded at 40 feet bgs in 1978 and the highest production unit occurs at least 100 feet below the static water level. The well casing extends 12-inches above the ground level and is located outside of a 100-year floodplain, decreasing the chance of contaminants being drawn into the drinking water source by surface water flooding.

The Idaho Department of Water Resources (IDWR) *Well Construction Standards Rules (1993)* require all public water systems to follow DEQ standards. IDAPA 58.01.08.550 requires that PWSs follow the *Recommended Standards for Water Works (1997)* during construction. Under current standards, all PWS wells are required to have a 50-foot buffer around the wellhead and if the well is designed to yield greater than 50 gallons per minute (gpm) a minimum of a 6-hour pump test is required. These standards are used to rate the system construction for the well by evaluating items such as condition of wellhead and surface seal, whether the casing and annular space is within consolidated material or 18 feet below the surface, the thickness of the casing, etc. If all criteria are not met, the public water source does not meet the IDWR Well Construction Standards. In this case, the S&N well casing is 10-inches in diameter and has a casing thickness of 0.250-inches (required thickness is 0.365-inches). For the Tyhee well the 8-inch casing has a casing thickness of 0.250-inches (required thickness is 0.322-inches). For both wells, there was insufficient information available to determine if adequate pump tests were performed on the wells.

Potential Contaminant Source and Land Use

The potential contaminant sources and land use within the delineated zones of water contribution are assessed to determine the well's susceptibility. When agriculture is the predominant land use in the area, this may increase the likelihood of agricultural wastewater infiltrating the ground water system. Agricultural land is counted as a source of leachable contaminants and points are assigned to this rating based on the percentage of agricultural land. The predominant land use within the delineated capture zones of the Tyhee and S&N Estates Water Association is irrigated agricultural land.

In terms of potential contaminant sources and land use susceptibility the ratings are as follows. Both wells rated high for IOCs (i.e., nitrates), VOCs (i.e. petroleum related products), and SOCs (i.e., pesticides) and moderate for microbial contaminants (i.e., fecal coliform).

Most of the potential contaminant sources fall within the 0-3 year time of travel zones. These sources include, surface water bodies (canals), a railroad, a sand and gravel pit, and transportation corridors, such as roadways. The locations of potential contaminant sources and delineated TOT zones for the wells are shown on Figure 2.

Final Susceptibility Rating

A detection above a drinking water standard (MCL), any detection of a VOC or SOC, or having potential contaminant sources within 50 feet of the wellhead will automatically give a high susceptibility rating to the final well ranking despite the land use of the area because a pathway for contamination already exists. Hydrologic sensitivity and system construction scores are heavily weighted in the final scores. Having multiple potential contaminant sources in the 0 to 3-year time of travel zone (Zone 1B) and a large percentage of agricultural land contribute greatly to the overall ranking. The final susceptibility ranking for the wells were high for IOC, VOC, SOC, and microbial contaminants. These ratings reflect the hydrologic sensitivity, system construction, and potential contaminants inventory and land use within the delineated source water assessment areas for the well.

Table 2. Summary of Tyhee and S&N Estates Water Association Susceptibility Evaluation

Drinking Water Sources	Susceptibility Scores									
	Hydrologic Sensitivity	Contaminant Inventory				System Construction	Final Susceptibility Ranking			
		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
Tyhee well	H	H	H	H	M	H	H*	H	H	H
S&N well	H	H	H	H	M	M	H	H*	H	H

H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility

IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical, H* Indicates source automatically scored as high susceptibility due to the detection of VOC in the finished drinking water

Susceptibility Summary

The IOCs chemicals arsenic, barium, chromium, fluoride, mercury, nitrate and sodium represent the main water chemistry recorded in the public water system, although the reported concentrations of these chemicals were below the MCL for each chemical. The VOC chemicals, tetrachloroethylene and 1,2-dichloroethane, have been detected in the drinking water from 1993 to 1997. The 1,2-dichloroethane was detected above the MCL of 5 micrograms per liter in July 1996.

The county level agriculture-chemical use is considered medium in this area due to the amount of agricultural land. Although there may only be a small portion of agriculture land in the direct vicinity of the well, it is useful as a tool in determining the overall chemical usage such as pesticides and how it may impact ground water through infiltration and surface water runoff. In addition, there were potential sources of contamination found within the wells' delineated TOT zones (Figure 2).

Section 4. Options for Drinking Water Protection

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed drinking water protection program will incorporate many strategies. For the Tyhee and S&N Estates Water Association, drinking water protection activities should continue efforts aimed at keeping the distribution system free of microbial contaminants that may affect the drinking water quality. At the present time, no volatile organic chemicals have been detected. However, if tetrachloroethylene concentrations or exceed the MCL, the system should take appropriate measures to treat the water source. Treatments, such as disinfectant and filtration for microbials and granular activated charcoal and packed tower aeration for VOCs should be investigated to remedy these problems. In addition, drinking water protection activities should focus on correcting any deficiencies outlined in the sanitary survey. The well should maintain sanitary standards regarding wellhead protection. Also, any new sources that could be considered potential contaminant sources in the well's zones of contribution should also be investigated and monitored to prevent future contamination. No potential contaminants (pesticides, paint, fuel, cleaning supplies, etc.) should be stored or applied within 50 feet of the well. Land uses within most of the source water assessment area are outside the direct jurisdiction of the Tyhee and S&N Estates Water Association. Therefore partnerships with state and local agencies, industrial and commercial groups should be established to ensure future land uses are protective of ground water quality. Educating homeowners and the public about source water will further assist the system in its monitoring and protection efforts.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan. Public education topics could include household hazardous waste disposal methods and the importance of water conservation to name but a few. There are multiple resources available to help water systems implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture and the Bannock County Soil and Water Conservation District. Any major transportation corridors that intersect the delineation (such as Interstate 15), the Idaho Department of Transportation should be involved in protection efforts.

Assistance

Public water supplies and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

DEQ Pocatello Regional Office (208) 236-6160

DEQ State Office (208) 373-0502

Website: <http://www.deq.state.id.us>

Water suppliers serving fewer than 10,000 persons may contact Melinda Harper (mlharper@idahoruralwater.com), Idaho Rural Water Association, at (208) 343-7001 for assistance with drinking water protection (formerly wellhead protection) strategies.

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POTENTIAL CONTAMINANT INVENTORY

LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as ASuperfund, is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100-year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5 mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RCRA – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Attachment A

Tyhee and S&N Estates Water Association Susceptibility Analysis Worksheet

The final scores for the susceptibility analysis were determined using the following formulas:

- 1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.222)
- 2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.375)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility

6 - 12 Moderate Susceptibility

≥ 13 High Susceptibility

1. System Construction

SCORE

Drill Date	1/1/78	
Driller Log Available	YES	
Sanitary Survey (if yes, indicate date of last survey)	YES	1999
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	NO	1
Casing and annular seal extend to low permeability unit	NO	2
Highest production 100 feet below static water level	YES	0
Well located outside the 100 year flood plain	YES	0

Total System Construction Score 4

2. Hydrologic Sensitivity

Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	YES	1
Depth to first water > 300 feet	NO	1
Aquitard present with > 50 feet cumulative thickness	NO	2

Total Hydrologic Score 6

3. Potential Contaminant / Land Use - ZONE 1A

IOC Score VOC Score SOC Score Microbial Score

Land Use Zone 1A	IRRIGATED CROPLAND	2	2	2	2
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	YES	NO	YES	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		2	2	2	2

Potential Contaminant / Land Use - ZONE 1B

Contaminant sources present (Number of Sources)	YES	11	11	12	6
(Score = # Sources X 2) 8 Points Maximum		8	8	8	8
Sources of Class II or III leacheable contaminants or	YES	10	10	5	
4 Points Maximum		4	4	4	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	2	0
Land use Zone 1B Greater Than 50% Irrigated Agricultural Land		4	4	4	4

Total Potential Contaminant Source / Land Use Score - Zone 1B 18 16 18 12

Potential Contaminant / Land Use - ZONE II

Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II Greater Than 50% Irrigated Agricultural Land		2	2	2	

Potential Contaminant Source / Land Use Score - Zone II 5 5 5 0

Potential Contaminant / Land Use - ZONE III

Contaminant Source Present	NO	0	0	0	
Sources of Class II or III leacheable contaminants or	NO	0	0	0	
Is there irrigated agricultural lands that occupy > 50% of	NO	0	0	0	

Total Potential Contaminant Source / Land Use Score - Zone III	0	0	0	0
Cumulative Potential Contaminant / Land Use Score	25	23	25	14
4. Final Susceptibility Source Score	15	15	15	15
5. Final Well Ranking	High	High	High	High

1. System Construction

SCORE

Drill Date	5/2/93	
Driller Log Available	YES	
Sanitary Survey (if yes, indicate date of last survey)	YES	1999
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	NO	1
Casing and annular seal extend to low permeability unit	NO	2
Highest production 100 feet below static water level	NO	1
Well located outside the 100 year flood plain	YES	0

Total System Construction Score 5

2. Hydrologic Sensitivity

Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	NO	0
Depth to first water > 300 feet	NO	1
Aquitard present with > 50 feet cumulative thickness	NO	2

Total Hydrologic Score 5

3. Potential Contaminant / Land Use - ZONE 1A

IOC Score	VOC Score	SOC Score	Microbial Score
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Land Use Zone 1A	IRRIGATED CROPLAND	2	2	2	2
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	YES	NO	YES	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		2	2	2	2

Potential Contaminant / Land Use - ZONE 1B

Contaminant sources present (Number of Sources)	YES	13	11	12	8
(Score = # Sources X 2) 8 Points Maximum		8	8	8	8
Sources of Class II or III leacheable contaminants or	YES	12	10	5	
4 Points Maximum		4	4	4	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	2	0
Land use Zone 1B Greater Than 50% Irrigated Agricultural Land		4	4	4	4

Total Potential Contaminant Source / Land Use Score - Zone 1B 18 16 18 12

Potential Contaminant / Land Use - ZONE II

Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II Greater Than 50% Irrigated Agricultural Land		2	2	2	

Potential Contaminant Source / Land Use Score - Zone II 5 5 5 0

Potential Contaminant / Land Use - ZONE III

Contaminant Source Present	NO	0	0	0	
Sources of Class II or III leacheable contaminants or	NO	0	0	0	
Is there irrigated agricultural lands that occupy > 50% of	NO	0	0	0	

Total Potential Contaminant Source / Land Use Score - Zone III	0	0	0	0
Cumulative Potential Contaminant / Land Use Score	25	23	25	14
4. Final Susceptibility Source Score	15	15	15	15
5. Final Well Ranking	High	High	High	High